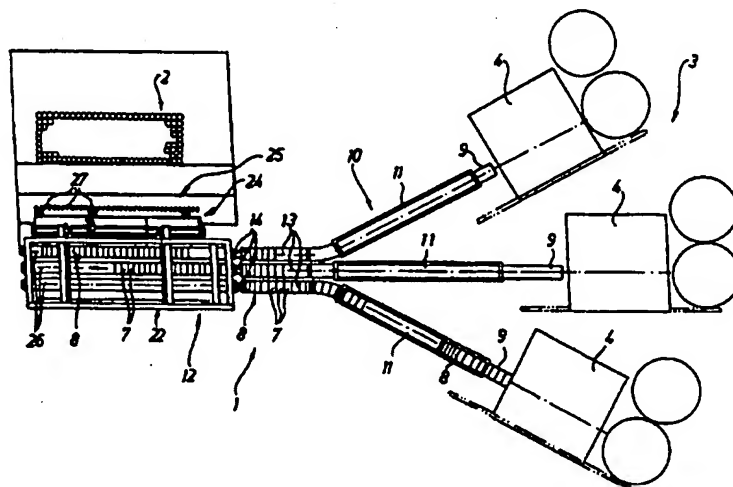




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/SE95/00232</p> <p>(22) International Filing Date: 5 March 1995 (05.03.95)</p> <p>(71) Applicant (for all designated States except US): NEW TECHNOLOGY I LIDKÖPING AB [SE/SE]; Skepparegatan 14, S-531 30 Lidköping (SE).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): NORDQVIST, Christer [SE/SE]; Kvarngatan 17, S-531 30 Lidköping (SE).</p> <p>(74) Agent: AWAPATENT AB; P.O. Box 11394, S-404 28 Göteborg (SE).</p>	<p>(81) Designated States: AM, AT, AT (Utility model), AU, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SK (Utility model), TJ, TT, UA, US, UZ, VN, ARIPO patent (KE, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. In English translation (filed in Swedish).</p>	

(54) Title: APPARATUS FOR THE MANUFACTURE OF INNERSPRING CONSTRUCTIONS



## (57) Abstract

In an apparatus (1) for the manufacture of spring carcasses (2) a coiling station (3) in which springs (5) are manufactured and by means of welding are enclosed in pockets (7) of a heatsealable fabric (6) to form lengths (8) of such pocket springs, and a buffer station (10) for receiving the pocket-spring lengths (8) from the coiling station (3), storing them temporarily and transferring them to an assembly station (25), wherein a number of pocket-spring lengths (8) corresponding to the size of the spring carcass (2) to be manufactured is assembled to form the spring carcass. A transfer station (12) is positioned between the buffer station (10) and the assembly station (25) and includes both a welding and cutting unit (14) in which pocket-spring lengths (8) arriving from the buffer station (10) are welded and cut into the correct longitudinal dimension, and a conveyance unit (22) advancing the cut pocket-spring lengths (8) from the welding and cutting unit (14) to a pick-up position, wherein an assembly unit (24) in turn picks up the pocket-spring lengths one by one in the pick-up position and transfers them to the assembly station (25).

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Apparatus for the manufacture of innerspring constructions

#### TECNICAL FIELD

5       The subject invention concerns an apparatus for the manufacture of spring carcasses of pocket spring type for use in e.g. beds and similar objects, said apparatus comprising a coiling station in which springs are manufactured and by means of welding are enclosed in pockets of  
10 a heat-sealable fabric to form lengths of such pocket springs, and a buffer station for receiving the pocket-spring lengths from the coiling station, storing them temporarily, and transferring them to an assembly station, wherein a number of pocket-spring lengths corresponding to  
15 the size of the spring carcass to be manufactured, is assembled to form the spring carcass.

#### BACKGROUND OF THE INVENTION

In accordance with one prior-art apparatus of the  
20 kind above the pocket-spring length, arriving from the coiling station in a preferably continuous manner, is transferred to one of several mobile buffer carriages incorporated in the buffer station. When one buffer carriage is full, the pocket-spring length is cut where-  
25 upon the carriage, possibly after having been put in an intermediate storage, is rolled up to the assembly station.

With the aid of a cutting tool, i.e. a pair of scissors or the like, the operator in that station manually  
30 cuts the pocket-spring length to the desired length (corresponding to the length of the spring carcass to be manufactured), i.e. by counting the number of spring pockets making up the correct pocket-spring length. Should the number of spring pockets be too small the operator  
35 needs to join the too short pocket-spring length, usually by means of welding, to the longer pocket-spring length, the supplementary length being taken from the immediately

following buffer carriage.

The pocket-spring length thus cut into the correct longitudinal dimension are handed over one by one to another operator who successively positions them in the correct position on an insertion device and who, having checked the position and if needed adjusted the position of the pocket-spring length on the insertion device activates the latter, whereby said device in turn introduces the pocket-spring length into the assembly station for interconnection with previous pocket spring lengths of the correct longitudinal dimension to form a spring carcass having the desired size.

Owing to the necessarily high concentration required from the operators and because of the often monotonous operations, the above described, manual handling often contributes to increased fatigue and thus to increased risks for operational injuries and manufacturing faults.

In addition, it is often difficult to fully utilize the capacity of the apparatus for longer periods of time.

#### PURPOSE OF THE INVENTION

The purpose of the subject invention is to considerably reduce the above disadvantages and drawbacks by providing measures which in a simple and cost-efficient manner allows the entire apparatus to be run completely automatically.

#### SUMMARY OF THE INVENTION

The above and other purposes of the invention are achieved owing to the specific particularities and features that characterize the apparatus in accordance with the invention as set forth in the appended claims.

Thus, the invention is characterized by a transfer station positioned between the buffer station and the assembly station and including both a welding and cutting unit in which pocket spring lengths arriving from the buffer station are welded and cut into the correct longi-

tudinal dimension in dependency of the size of the spring carcass to be manufactured, and a conveyance unit advancing the cut pocket-spring lengths from the welding and cutting unit to a pick-up position wherein an assembly unit in turn picks up the pocket-spring lengths one by one in the pick-up position and transfers them to the assembly station to form a spring carcass having the desired size, i.e. the correct length and width.

#### 10 BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in closer detail in the following with reference to the accompanying drawings, wherein

Fig. 1 in a view from above schematically illustrates the apparatus in accordance with the invention and the mutual positions of the stations and the units included therein,

Fig. 2 illustrates part of the apparatus in accordance with Fig. 1 in a schematical lateral view,

20 Fig. 3 illustrates in a lateral view and on an enlarged scale a part of the transfer station incorporated in the apparatus in accordance with the invention,

Fig. 4 illustrates the transfer station in a lateral view in cooperation with an assembly unit incorporated in the apparatus in accordance with the invention,

25 Fig. 5 illustrates the transfer station in accordance with Fig. 4 in an end view in the direction indicated by arrow V, and

30 Fig. 6 indicates gripping means forming part of the assembly unit, in the direction of arrow VI in Fig. 5.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

The apparatus in accordance with the invention which is illustrated in the drawings and generally designated by reference 1, is primarily intended for the manufacture of spring carcasses 2 of pocket-spring type, primarily intended for beds and similar objects.

The apparatus 1 includes a coiling station 3 which in accordance with the embodiment illustrated includes three automatic coiling machines 4 of prior art design. The automatic coiling machines 4 produces coiled springs 5 of steel wire or other suitable material and in a manner known per se these springs are welded into pockets/ /springs 7 which pockets are made from a heat-sealable fabric 6 of preferably non-woven type or the like, to form continuous pocket-spring lengths 8.

10 The three automatic coiling machine 4 of the coiling station 3 has a capacity of approximately 55-70 springs 7 per minute each, in accordance with the embodiment illustrated, and by means of power-operated and schematically illustrated feed-in conveyor belts 9, including driver  
15 dogs, they are associated with their respective one of buffer containers 11 incorporated in the buffer station 10 of the apparatus 1 for the purpose of receiving the pocket-spring lengths 8 from the automatic coiling machines 4.

20 On the feed-in conveyor belts 9 leading to the three buffer containers 11 coupled in parallel there is provided a monitoring station, not illustrated in detail, serving to sense the height of the springs 7 during the feed-in of the spring-pocket lengths 8, to allow setting of the  
25 values of maximum and minimum deviations. Missing springs could also be detected in the monitoring station and in case of faults the feed-in operation is stopped and an alarm signal is issued.

The three buffer containers 11 store the pocket-  
30 spring lengths 8 arriving from the automatic coiling machines 4 temporarily and they each have a storage capacity of approximately 500 pocket springs 7. The reason for the provision of the buffer containers 11 is to increase the efficiency and to provide for optimum utilization of  
35 the apparatus by preventing shut-down of the apparatus, for example as a result of interrupted operation of a coiling machine 4 or of such a machine being stopped as

a consequence of spring or fabric replacements, checks and possibly adjustments of the pocket springs 7.

In addition, the buffer containers 11 equalize the flow and reduce the start and stop cycles in the automatic coiling machines 4 when the operative speed of a transfer station 12, to be described later on and incorporated in the apparatus, is increased.

Via power-driven conveyor belts 13 including dogs and not to be described in closer detail, the three buffer containers 11 are associated with the transfer station 12, more precisely to their respective one of the welding and cutting units 14 included in said station. In these welding and cutting units 14 the spring-pocket length 8, arriving from the associated buffer containers 11 via the conveyance belts 13 a, e cut into the correct longitudinal dimensions with respect to the size of the spring carcass 2 to be manufactured.

In accordance with the preferred embodiment of the invention each welding and cutting unit 14 includes a preferably ultrasonic welding head 15 and the welding heads are connected to a common generator, not shown, which is controllable to activate the selected one of the welding heads 15. Each welding head 15 is arranged to be moved essentially linearly to and fro by means of a driver means 16, such as a pneumatically operated cylinder not to be described in closer detail, into abutment against a welding pad 17, with the fabric 6 between two juxtaposed spring pockets/springs 7 sandwiched between said pad and said welding head, so as to form two parallel, spaced-apart welding seams 18. In accordance with the preferred embodiment and with a view to form the welding seams 18 as shown, each welding head 15 is formed with two, likewise parallel and spaced-apart welding members 19. The two welding elements 19 are essentially straight and have a length substantially corresponding to the width of the pocket-spring lengths 8.

Besides the welding head 15, the welding and cutting unit 14 also comprises a cutting means 20, preferably in the form of a knife, preferably of hooked flooring knife type. The purpose of the cutting means 20 is to cut the fabric 6 intermediate the two welding seams 18, imparting to the pocket-spring lengths 8 the correct, predetermined longitudinal dimension and so as to ensure that they are correctly welded together at their ends. In accordance with the embodiment shown and described the knife-like cutting means 20 is arranged for essentially linear to and fro movements in a groove 21 or similar recesses formed in the associated welding pad 17, extending essentially in parallel with said welding members 19, for the purpose of effecting the sought-after cutting/severing of the fabric 6 intermediate the welding seams 18.

In addition to the welding and cutting unit 14 described above, the transfer unit 12 also includes a conveyance unit 22, advancing the pocket-spring lengths 8 cut in the welding and cutting unit 14 to a pick-up position 23 in readiness for an assembly unit 24 to be described in detail later on. In turn, the assembly unit 24 picks up the pocket-spring lengths 8 one by one in the pick-up position 23 and transfers them to the assembly station 25, included in the apparatus as the last principal component thereof, wherein a number of pocket-spring lengths corresponding to the predetermined dimensions of the spring carcass 2 to be produced, are assembled in a manner known per se to form the spring carcass 2.

In accordance with a preferred embodiment the conveyance unit 22 comprises three individual conveyor belts 26 including driver dogs 27, which belts are power-operated in a manner not disclosed in detail, to advance the cut pocket-spring lengths 8 from the welding and cutting unit 14 to the pick-up position 23 of the assembly unit 24. More precisely, the assembly unit 24 comprises a number of fixed pick-up positions that equals the number of conveyor belts 26, i.e. in the case described three fixed pick-up



positions. The assembly unit 24 is moveable essentially linearly backwards and forwards above the conveyor belts 26 of the conveyance unit 22, essentially at right angles to the direction of conveyance VII in order to be able to  
5 move to the pick-up position 23 which at any instance is the optimum one for transferring the pocket-spring lengths 8 one by one to the assembly station 25 in order to achieve the sought-after maximum efficiency in the apparatus 1.

10 In accordance with a preferred embodiment the assembly unit 24 comprises a number of grip means 27 arranged, in any selected pick-stick-up position, to be moved into engagement with the spring pockets/springs 7 of the associated pocket-spring length 8 in order to hold, by gripp-  
15 ing action, the pocket-spring length during the transfer and, upon arrival in said assembly station 25 to be disengaged from said pockets/springs to release the pocket-spring length from the assembly unit 24.

More precisely, the number of grip means 27 preferably is identical with the number of spring pockets/  
20 /pockets 7 of the associated pocket-spring length 8. From an essentially horizontal starting position shown in Fig. 5 the grip means 27 may be pivoted by means of elements not shown in closer detail, for instance one or several  
25 pneumatically operated cylinders, over about 90° downwards to the position of abutment illustrated at A in Fig. 5, in which position they engage the spring pockets/springs 7, and from this position of engagement over about 90° in a direction upwards to an essentially horizontal position  
30 of transfer, indicated in Fig. 5 at B, which position of transfer also is said starting position, to effect the transfer to the assembly station 25 while asserting the gripping hold action.

Preferably, each grip means 27 is formed with at  
35 least two sharp needles 28 arranged to pierce the fabric 6 of the spring pockets/springs 7 for engagement therewith. In accordance with the illustrated preferred embodiment of

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the invention the needles 28 are supported in a projecting position by the free ends of essentially oppositely disposed holding arms 29, which arms are mounted for pivotal movement in the assembly unit 24 or in a component associated therewith, and by means of an actuating mechanism 30, such as a toggle mechanism or the like, they are pivotable in a direction towards and away from each other to bring said needles 28 into and out of engagement of said spring pockets/springs 7.

Obviously the invention should not be considered limited to the described and illustrated embodiment, which is the one that is preferred at the moment, but could be modified according to wish within the scope of the protection defined in the appended claims.

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CLAIMS

1. An apparatus for the manufacture of spring carcasses (2) of pocket spring type, for use in e.g. beds and similar objects, said apparatus (1) comprising a coiling station (3) in which springs (5) are manufactured and by means of welding are enclosed in pockets (7) of a heat-sealable fabric (6) to form lengths (8) of such pocket springs, and a buffer station (10) for receiving the pocket-spring lengths (8) from the coiling station (3), storing them temporarily and transferring them to an assembly station (25), wherein a number of pocket-spring lengths (8) corresponding to the size of the spring carcass (2) to be manufactured is assembled to form the spring carcass, characterized by a transfer station (12) positioned between the buffer station (10) and the assembly station (25) and including both a welding and cutting unit (14) in which pocket-spring lengths (8) arriving from the buffer station (10) are welded and cut into the correct longitudinal dimension in dependency of the size of the spring carcass (2) to be manufactured, and a conveyance unit (22) advancing the cut pocket-spring lengths (8) from the welding and cutting unit (14) to a pick-up position (23), wherein an assembly unit (24) in turn picks up the pocket-spring lengths one by one in the pick-up position and transfers them to the assembly station (25).

2. An apparatus as claimed in claim 1, characterized in that the welding and cutting unit (14) comprises a preferably ultrasonic welding head (15) arranged to be moved into abutment against a welding pad (17) with the fabric (6) between two juxtaposed spring pockets (7) sandwiched between said pad and said welding head, in order to form in said fabric two parallel spaced-apart welding seams (18), as well as a cutting means (20) for cutting the fabric (6) between the two welding seams (18), whereby the pocket-spring lengths will be given the accurate longitudinal dimensions and their ends be

correctly welded together.

3. An apparatus as claimed in claims 1 and 2,  
c h a r a c t e r i z e d in that the welding head (15)  
is movable essentially linearly to and fro, and in that it  
5 is formed with two parallel, spaced-apart welding members  
(19), said members being essentially straight and having a  
length substantially corresponding to the width of the  
pocket-spring lengths (8).

4. An apparatus as claimed in any one of the pre-  
10 ceding claims, c h a r a c t e r i z e d in that the  
cutting means (20) preferably is in the form of a knife  
which is movable essentially linearly backwards and for-  
wards in a groove (21) formed in the welding pad (17),  
essentially in parallel with said welding members (19),  
15 for the purpose of cutting off said fabric (6) interme-  
diate the welding seams (18).

5. An apparatus as claimed in any one of the pre-  
ceding claims, c h a r a c t e r i z e d in that said  
conveyance unit (22) comprises a conveyor belt (26) inclu-  
20 ding driver dogs for advancing the cut spring-pocket  
lengths (8) from the welding and cutting unit (14) to the  
pick-up position (23) of the assembly unit (24).

6. An apparatus as claimed in any one of the pre-  
ceding claims, c h a r a c t e r i z e d in that said  
25 assembly unit (24) is movable essentially linearly back-  
wards and forwards above the conveyance unit (22) and  
essentially at right angles to the direction of convey-  
ance, in order to transfer the pocket-spring lengths (8)  
one by one from the pick-up position (23) to the assembly  
30 station (26).

7. An apparatus as claimed in claim 6, c h a r a c-  
t e r i z e d in that the assembly unit (24) comprises a  
number of grip means (27) arranged, in the pick-up posi-  
tion (23), to be moved into engagement with the spring  
35 pockets (7) of the associated pocket-spring length (8) in  
order to hold, by gripping action, said pocket-spring  
length during the transfer and, upon arrival in said

assembly station (25), to be disengaged from said pocket, to release the pocket-spring length from the assembly unit.

8. An apparatus as claimed in claim 7, c h a r a c-  
5 t e r i z e d in that the number of said gripper means (27) preferably is identical with the number of spring pockets (7) of the associated pocket-spring length (8) and in that said grip means, from a starting position, are pivotable over about 90° in a direction downwards, into a  
10 position of engagement (A) in which they engage the spring pockets (7) and from there over about 90° in a direction upwards, into a position of transfer (B), to effect the transfer to the assembly station (25) while exerting the holding grip.

15 9. An apparatus as claimed in claims 7 and 8, c h a r a c t e r i z e d in that each gripper means (27) is formed with two sharp needles (28) arranged to pierce the fabric (6) of the spring pockets (7) for engagement therewith.

20 10. An apparatus as claimed in claim 9, c h a r a c- t e r i z e d in that the needles (28) project from the supporting free ends of essentially oppositely disposed holding arms (29), said arms mounted for pivotal movement in the assembly unit (24) and operated by an actuating  
25 mechanism (30) for pivotal movement towards and away from each other to bring said needles into and out of their engagement with said spring pockets (7).

11. An apparatus as claimed in any one of the pre-  
ceding claims, c h a r a c t e r i z e d in that the  
30 coiling station (3) comprises at least two and preferably three automatic coiling machines (4) and in that the buffer station (10), the welding and cutting unit (14), and the conveyance unit (22) preferably comprise a number of respectively buffer containers (11), welding heads (15)  
35 with associating welding pads (17) and cutting means (20), and conveyor belts corresponding to said number of automatic coiling machines (4).

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12. An apparatus as claimed in claim 11, c h a -  
r a c t e r i z e d in that the number of fixed pick-up  
positions (23) in the assembly unit (24) equals the number  
of the conveyor belts (26) and in that the assembly unit  
5 is arranged to be moved to the pick-up position that at  
anyone instance is the optimum one for obtaining the  
maximum efficiency in the apparatus (1).

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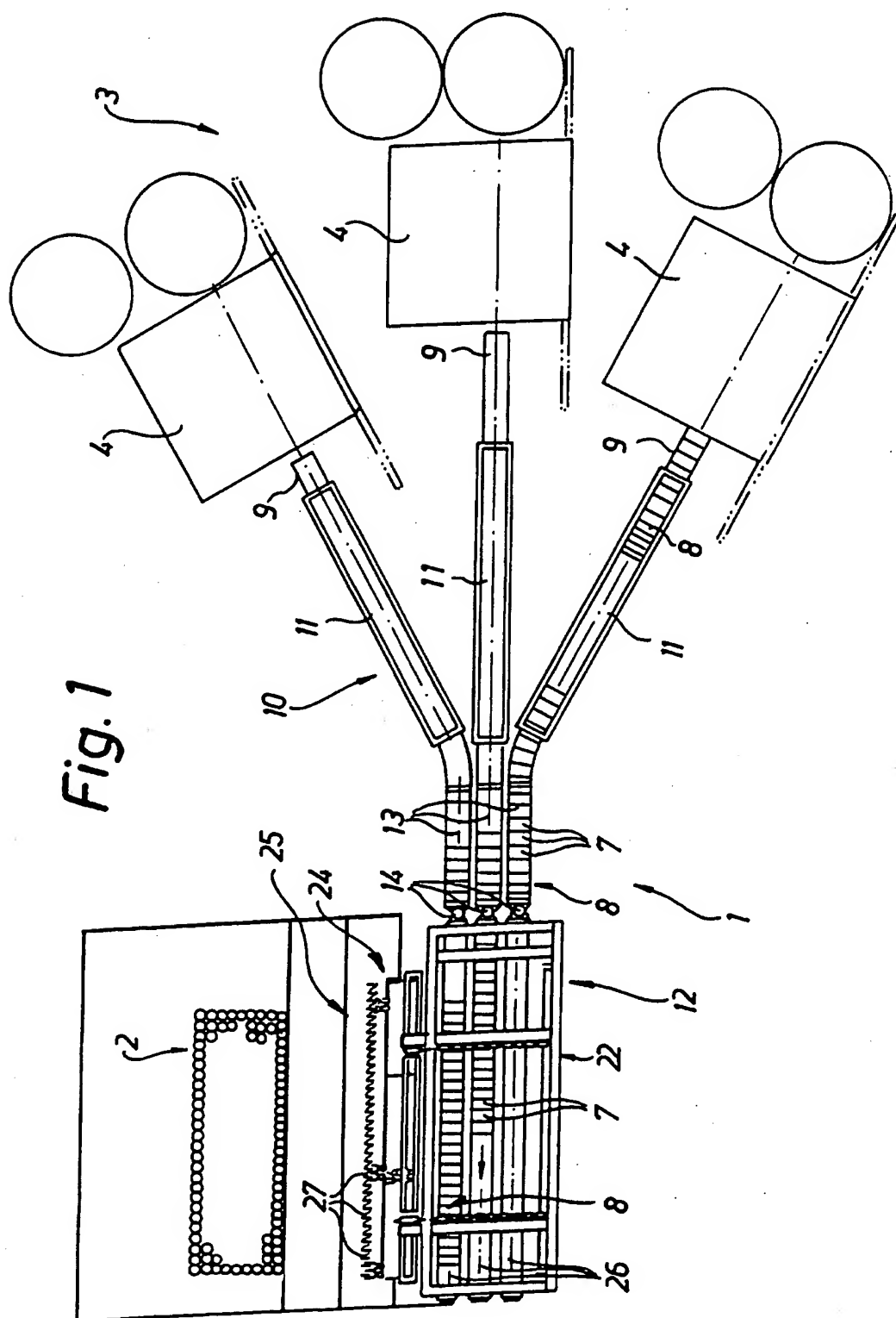
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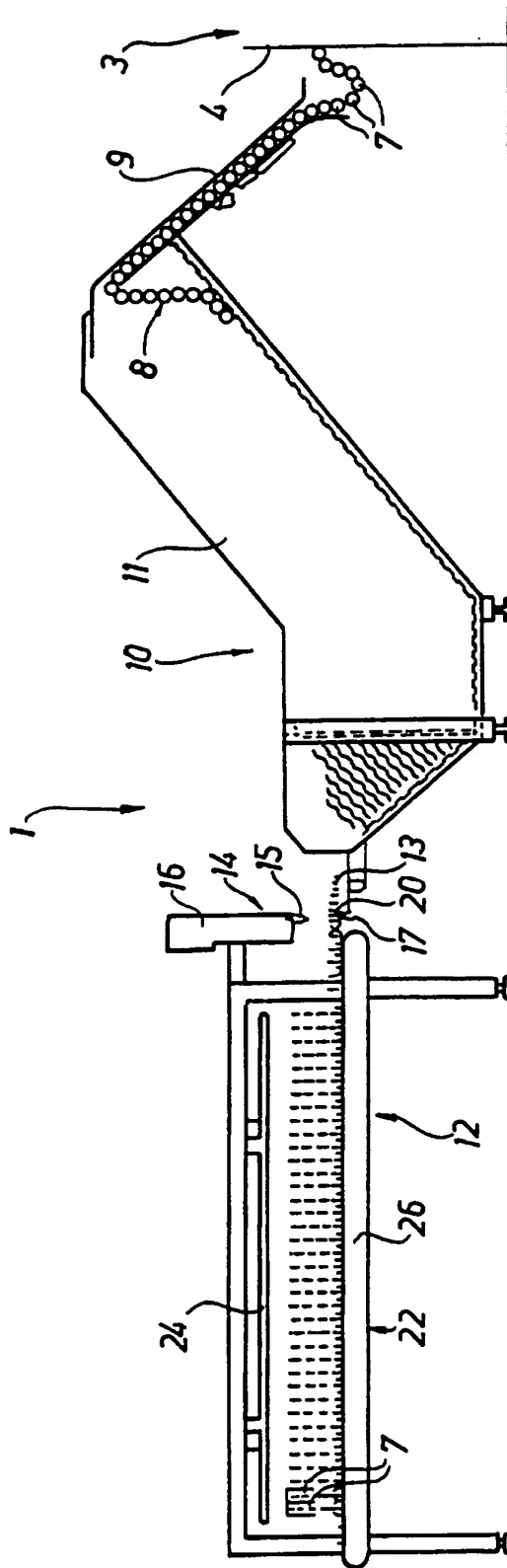


Fig. 2



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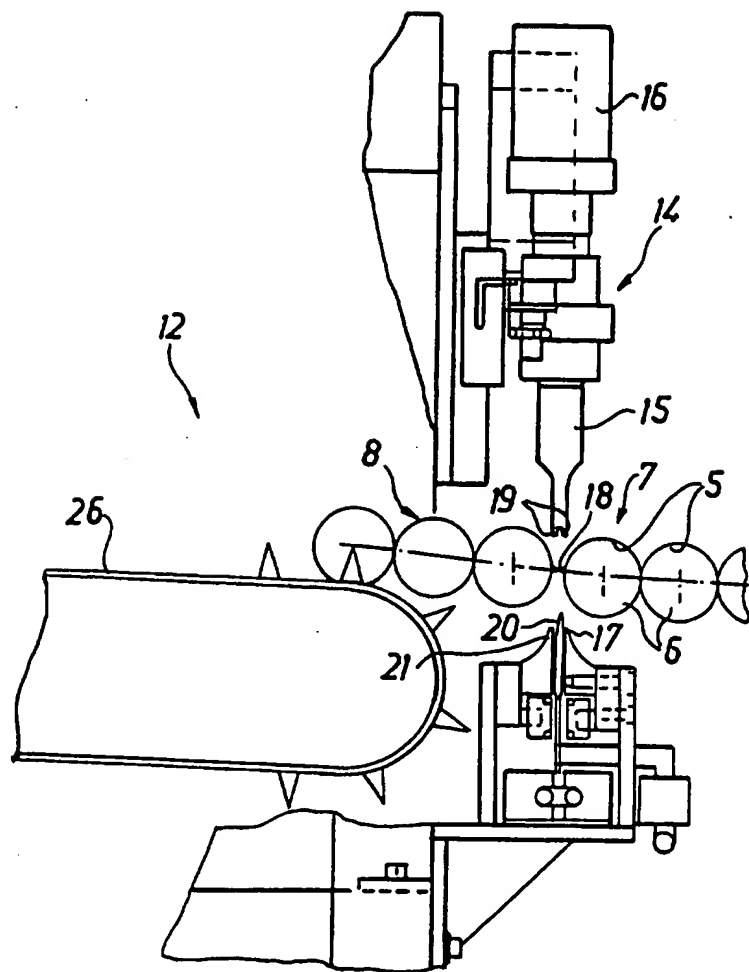
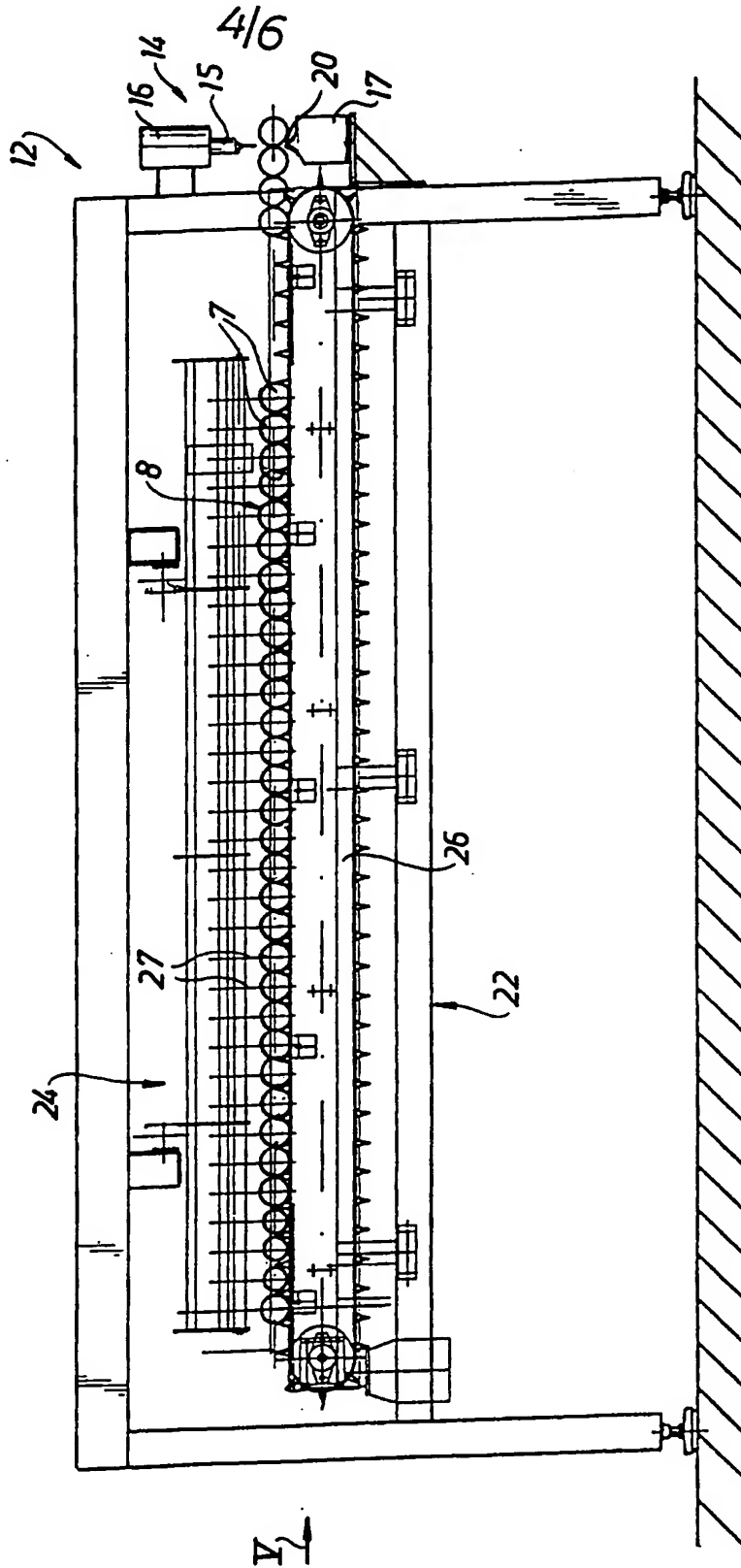


Fig. 3

Fig. 4



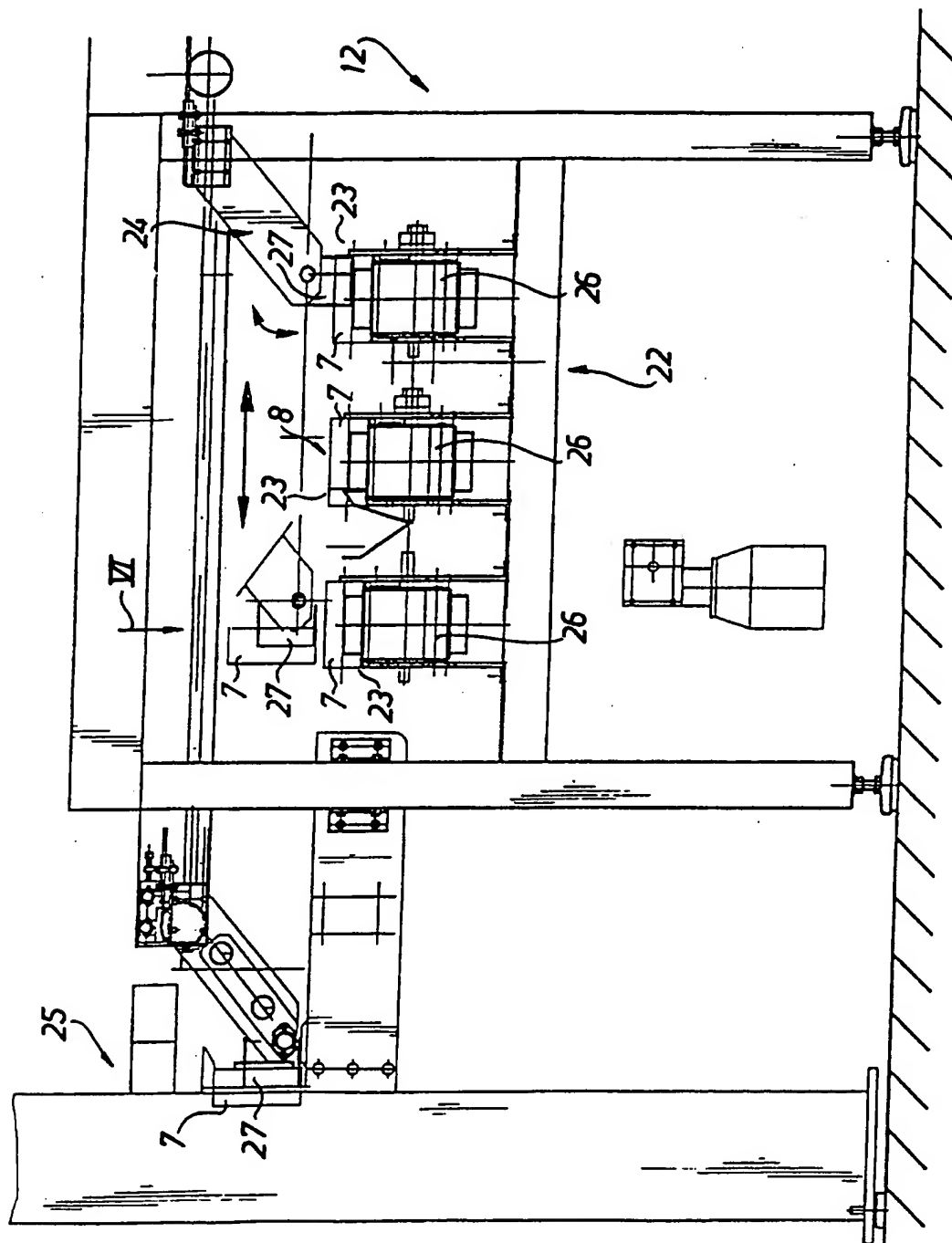
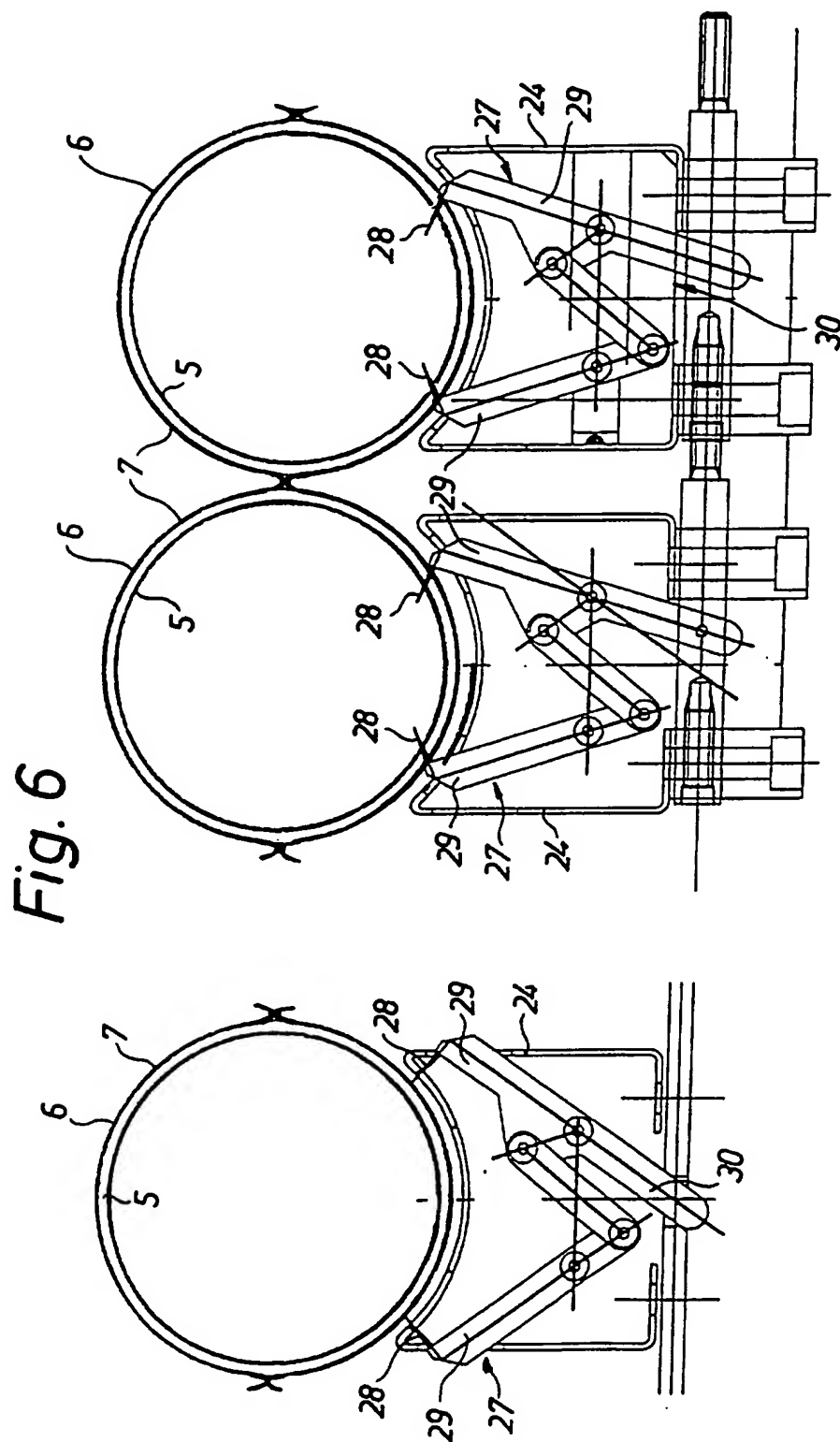


Fig. 5

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 95/00232

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B68G 9/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B68G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CLAIMS, WPIL, JAPIO

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0421495 A1 (B'LINEA), 10 April 1991 (10.04.91), column 1, line 26 - line 37; column 3, line 4 - line 20; column 7, line 58 - column 8, line 50, column 9, line 42 - line 53, column 10, line 6 - line 15, figures 1,4,6,7  --	1,2,5,6,8, 11,12
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

Date of mailing of the international search report

23 October 1995

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 95/00232

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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